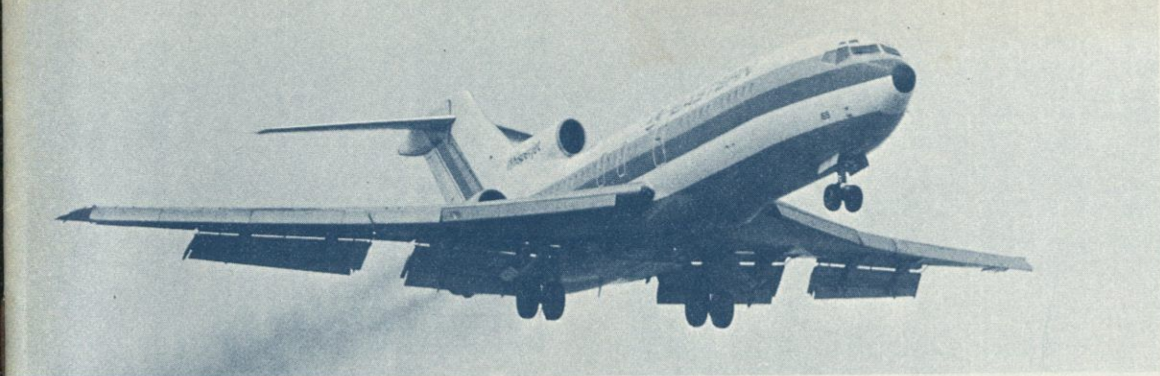
FAA AVIATION NEWS

SEPTEMBER 1969



COVER

Year long study of midair incidents pinpoints danger areas. Air traffic experts suggest 20 steps to greater safety. See page 4.

FAA AVIATION NEWS

DEPARTMENT OF TRANSPORTATION / **FEDERAL AVIATION ADMINISTRATION** VOL. 8, NO. 5

CONTENTS / September 1969

Page 8

Page 10

John A. Volpe, *Secretary of Transportation*

John H. Shaffer, *Administrator, FAA*

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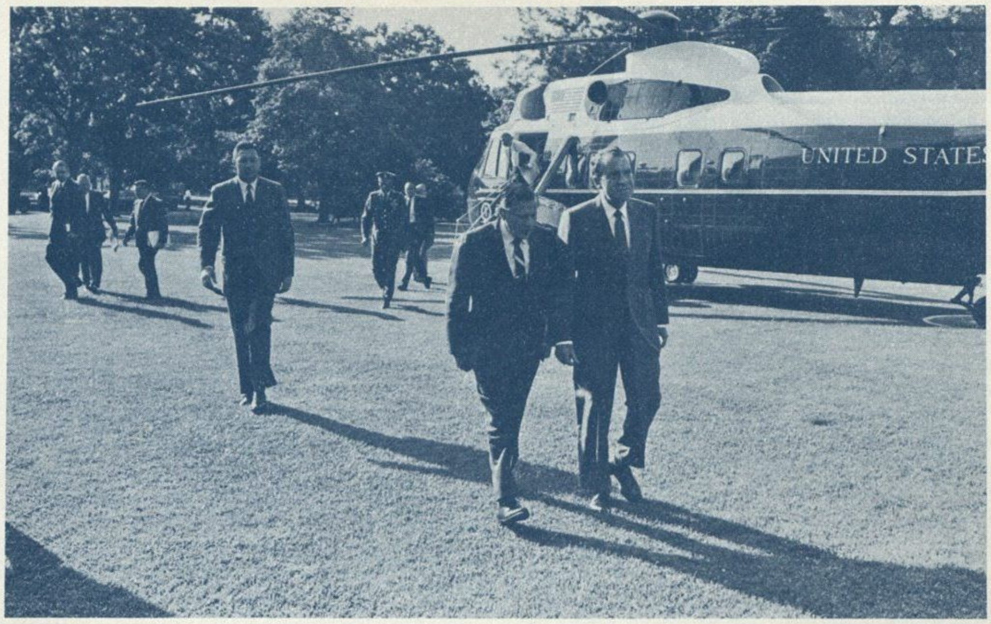
LOGJAMS in the sky

by John A. Volpe,
Secretary of Transportation



After landing on the White House lawn following an aerial survey of morning rush hour traffic, Secretary of Transportation John A. Volpe explains his views on coordinating ground and air transportation to President Nixon.

Today's logjams in the sky and at the Nation's airports must not be permitted to re-occur in the future.

Consider these facts:

—Total passengers carried in 1968 by U.S. airlines amounted to 75 percent of the Nation's population. At the rate passenger traffic is increasing, the total number of people carried will surpass the population within a short time.

—In the general aviation category, private fleets are doubling every decade. This segment of aviation will represent ten percent of the gross national product by 1980.

—Air freight hauled by commercial airlines jumped an unprecedented 21 percent last year over the previous twelve months.

With these supporting figures, the President has submitted an airport and airway development bill to the Congress for consideration during this session. The legislation maintains that if present growth in aviation is to continue, then both commercial and general aviation interests must share in the development costs to improve and update our airport and airways facilities.

The airport/airways program is based on a sound fiscal foundation. To neglect a sound base for financing new airport construction would be akin to continuing the neglect of the problem at the Nation's airports.

The Administration's bill, therefore, has a user tax base which would set up a designated account to protect the funds for use on the airports and airways.

The bill establishes a Federal commitment to a ten year $2.5 billion grant-in-aid program. It authorizes $1.25 billion over the next five years, commencing with $180 million in fiscal year 1970 and $220 million in fiscal 1971.

It also calls for establishing a planning grant program at an annual level not to exceed $10 million. These grants would be in two specific categories. One would be made available to area-wide planning agencies under the Demonstration Cities and Metropolitan Development Act of 1966 for airport system planning.

Such a grant type program could also be made available to any public agency for planning the development of a specific airport.

Also injected into this legislation is what we choose to call a "mandatory up-date" section, which requires the Secretary of Transportation to publish and revise at least every two years a plan setting forth the Nation's national airport requirements for the following ten years.

In this way, we hope to eliminate outmoded, out-dated model-T type airports and facilities endeavoring to serve the jet age.

State aviation agencies would benefit from the bill through a new grant program amounting to $5 million to assist them in carrying out state-sponsored programs for airport planning and development.

As aviation men know, the requirement for new and improved terminals, parking lots and other passenger handling facilities will require an estimated $3.5 billion over the next ten years. Because these facilities are good revenue producers, we conclude that it would be inappropriate at this time to expand Federal activity into this area when we ought to be encouraging and developing state and local capabilities.

To obtain some of the funds necessary for this ambitious but sorely needed program, the Administration is proposing to increase the existing passenger ticket tax from 5 to 8 percent. It would also impose a new tax of $3 on passenger tickets for most international flights beginning in the United States and for flights between the contiguous 48 states and Hawaii, Alaska, or outlying possessions of the United States.

Also proposed is a new tax on air freight waybills of 5 percent. In view of these new taxes, the existing gasoline tax of 4 cents per gallon would be fully refunded to the air carriers.

General aviation gasoline taxes would be increased to 9 cents per gallon and a new tax of 9 cents per gallon on other fuels used by general aviation would be added.

Not only is commercial aviation expanding at an ever increasing rate, but the startling facts are that our general aviation fleet over the past five years has been increasing its flying hours by 4,000 per day.

Just last year, as an example, nearly 8 million general aviation aircraft contacted our FAA flight service stations. There were 700,000 commercial carrier contacts.

At airports with FAA towers, last year 22 million general aviation aircraft made contact. Commercial aircraft tallied 10 million.

General aviation aircraft are using our facilities and they are using them every day. We think it only just that they help pay a fair share of the cost.

As the President said in his message to Congress: "The purpose of air transportation is to save time. This purpose is not served when passengers must wait interminably long in terminals; when modern jet aircraft creep along at five miles per hour or less awaiting take off instructions; when it takes longer to land than it took for the trip between two widely scattered cities; or when it takes longer for the air traveller to get to an airport than it does to fly to his destination."

The airport/airways legislation will help overcome the factors that deter the growth of Air Travel in the Twentieth Century. ■

Clearing the AIR

A 20-point program of remedial actions to cope with near midair collisions has been recommended to Federal Aviation Administrator John H. Shaffer by a special task force in its final report on a Study of Near Midair Collisions (NMAC) of 1968.

The recommendations resulted from analysis of 2,230 reports voluntarily submitted to FAA during 1968, almost entirely by pilots. Reports were submitted by 938 general aviation, 732 airline, and 555 military pilots. Five incidents were reported by FAA controllers.

About one-half of the 2,230 NMACs reported were classified by the study team as "hazardous." The remainder were classified as "non-hazardous," with the separation between aircraft exceeding 500 feet and ranging up to many miles.

FAA estimates that during the reporting period there were approximately 52.3 million flight operations of all types made in the United States. At this rate, one near midair collision report was filed for approximately every 25,000 operations. The rate of "hazardous" incidents was one for every 50,000 operations.

However, investigators believe that, despite the immunity from penalty and the anonymity guaranteed to all by FAA, at least four times as many hazardous near midair collisions occurred as were reported. There were 38 *actual* midair collisions between powered aircraft in 1968 in the United States, resulting in 68 fatalities.

20 Remedies

The 20 recommendations contained in the report are as follows:

(1) Develop and install, at selected large air transportation hubs, a system which would segregate by regulations or procedures all traffic operating within certain airspace designated for the primary airport(s).

(2) At all large air transportation hub locations, operate a radar separation service for all participating aircraft operating within an established Terminal Radar Service Area (STAGE III of the National Terminal Radar Program).

(3) Amend the FARs to require all aircraft operating in a control zone which has an operating control tower to establish two-way radio communications with the tower when at or below 3,500 feet above ground level (AGL).

(4) Publish for all large air transportation hubs in the *Airman's Information Manual* (AIM) a map to show the areas of concentrated IFR traffic for the information and guidance of pilots operating under visual flight rules (VFR). Establish a new VFR section in the AIM to include all references pertaining to VFR flight.

(5) Publish high density military areas, both training and operational, in appropriate airman information publications.

(6) Require management responsible for non-tower airports to establish traffic patterns and to publish, distribute, and prominently post these traffic patterns.

(7) Review the present regulations, policies and procedures concerning the establishment of airport traffic patterns at airports without a control tower to ensure that traffic patterns are established.

(8) Develop the concept of area navigation for both enroute and terminal air traffic.

(9) Launch a vigorous pilot education program to stress the importance of constant vigilance on the part of all pilots at all times under all circumstances; urge all pilots to develop a working knowledge of their operational airspace; and make certain that proper traffic pattern entry and departure, and aircraft spacing techniques are observed.

(10) Review flight training syllabuses and airmen examinations to assure that airmen are taught and are knowledgeable in those areas which have an impact on operating in today's airspace environment.

(11) Instill a higher degree of motivation among flight crew members to help increase vigilance outside the cockpit during all phases of flight.

(12) Encourage all airspace users when operating at or above 10,000 feet to fly on an IFR (instrument flight rules) flight plan, especially military jet fighter type aircraft.

(13) Amend the Federal Aviation Regulations (FARs) to require 1,000-foot vertical altitude separation immediately below the base of positive control airspace for aircraft operating VFR.

(14) Review military low-level, high-speed VFR training routes for their locations and necessity; and ensure maximum publicity for their location and hours of operation.

(15) Review the necessity for operating high performance military jet aircraft below 10,000 feet in excess of 250 knots indicated airspeed.

(16) Review the "Hemispheric Rules" for possible elimination of any reference to feet above the surface as a base altitude, and for lowering the cruising altitudes related to mean sea level (MSL) below the presently applicable 3,500 feet MSL.

(17) Review airport planning requirements to insure that future airport site locations are well clear of instrument approach courses.

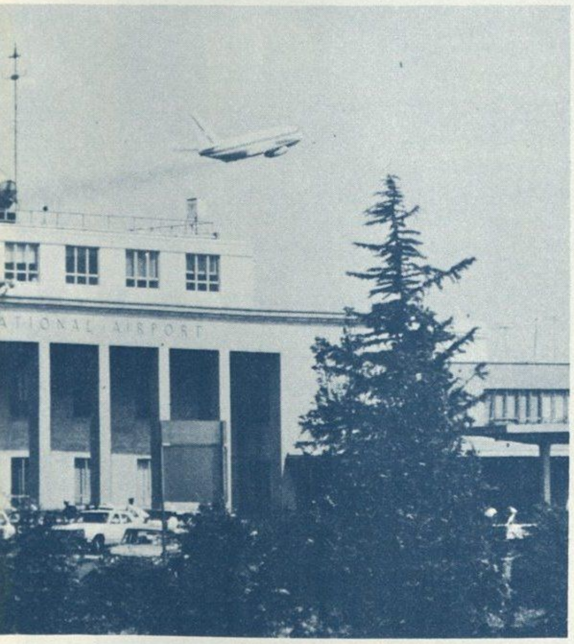
(18) Recognize the need for improved cockpit visibility in the development of all future aircraft.

(19) Direct an extensive effort toward the development of an airborne collision avoidance system, with cockpit displays, as a prime solution to the near midair collision problem.

(20) Where the above recommendations are applicable, military authority should consider appropriate coordinated action.

FAA Studying 20-point Program To Reduce Near Midair Collisions

Segregation of Traffic at High Density Terminals Heads List of Recommendations



FAA already has acted on many of the recommendations in the report and has taken other steps as well to reduce the problem of near midair collisions. Only last month, for example, the agency issued a notice of proposed rule making to establish area navigation routes, which would reduce the number of aircraft converging on navigation aids where a high percentage (40 per cent) of enroute near midairs occur.

In addition, FAA has stepped up its pilot education efforts. The agency has put a general aviation accident prevention specialist in 31 of FAA's general aviation district offices (GADOs) in the Central and Southwest Regions as a trial program.

The agency is also participating with industry in the development of a sophisticated Collision Avoidance System (CAS) for commercial aircraft as well as a low cost Proximity Warning Instrument for general aviation aircraft. FAA currently is participating with the Air Transport Association of America in a flight test evaluation of various CAS equipment.

FAA also is pushing ahead with the automation of the enroute portion of its air traffic control system. The automated system, which includes direct radar display of aircraft identity and altitude information, will first become operational at the agency's Jacksonville air route traffic control center where it is now under test and checkout. All 20 centers serving the continental United States will have the system by the end of 1973.

By that same date, the agency also expects to have similar automated systems installed at the 60 busiest airport control towers in the United States. The contract for the purchase and installation of this equipment was awarded last February.

Cause and Cure

All NMAC reports received during the study period were turned over to a special FAA Near Mid-Air Collision Study Group for analysis. The year long program was a joint effort of all segments of the aviation industry and FAA. Their objective was to identify basic causal factors and to develop appropriate corrective measures.

Terminal areas predominated over enroute airspace as the place of greatest frequency of reported incidents. The report lists 719 hazardous NMACs for terminal areas, as opposed to 409 in the enroute airspace. Of the 719 terminal incidents, 98 took place in the vicinity of non-tower airports. In the terminals with a control tower, conflicts with unknown traffic presented the most serious problem area.

As might be expected, NMACs were clustered around large metropolitan cities and along published airways. The study revealed that there was a direct relationship between the number of traffic operations at major terminals and the number of NMACs occurring at these large "hub" areas. Most incidents classed as hazardous were in the areas surrounding Los Angeles (97), New York (74), San Francisco (48), Washington, D.C. (33), Philadelphia (31), San Diego (37), Chicago (26), Denver (19), Kansas City (18), and Phoenix (18).

Problems to be Solved

In defining the causes of the 1,128 reported near midair collisions, the report listed 10 major problems in declining order of gravity:

See and Be Seen. This area covered aircraft flying in VFR weather and depending on the pilot's ability to see and avoid other traffic. Twenty-one per cent of the hazardous incidents fell in this area. The major cause listed was the fact that pilots frequently had difficulty sighting other traffic because of speed differences, aircraft silhouette, relative position or other reasons.

Mix of IFR/VFR Aircraft. Traffic involving uncontrolled mixture of VFR and IFR traffic accounted for 20 per cent of the incidents with three-fourths occurring in terminal airspace. The highest causal factor involved an aircraft climbing or descending and encountering another aircraft in level flight.

Airspace Navigation. The major causal factor involved aircraft converging on or diverging from a navigation aid, where 14 per cent of the incidents occurred.

Traffic Pattern. This problem was a factor in 12 per cent of the incidents and consisted primarily of one aircraft cutting another out of the traffic pattern.

Pilot Deviation Indicated. In the enroute area the major causes were pilots cruising at the wrong altitudes or failing to maintain altitude accurately. In the terminal area, the primary causal factor was pilots operating within an airport traffic area without radio communications or ATC clearances. Pilot deviation figured in 12 per cent of the hazardous incidents.

Training. Training operations figured in eight per cent of the hazardous incidents. The major cause involved preoccupation by pilots with training duties. Aerobatics and simulated IFR flying with hoods also were factors.

The remaining four problem areas were high-speed aircraft encountering low-speed aircraft, operations in marginal VFR conditions, proximity of airports with one another and resulting traffic conflictions, and air traffic control systems errors. These four problem areas accounted for 13 per cent of the reported hazardous incidents.

The study group was praised by Secretary of Transportation John A. Volpe for their "contributions [that] reflect a deep concern for making the nation's airways safe." ■

Altitude for Flareout

PERSPECTIVES VII

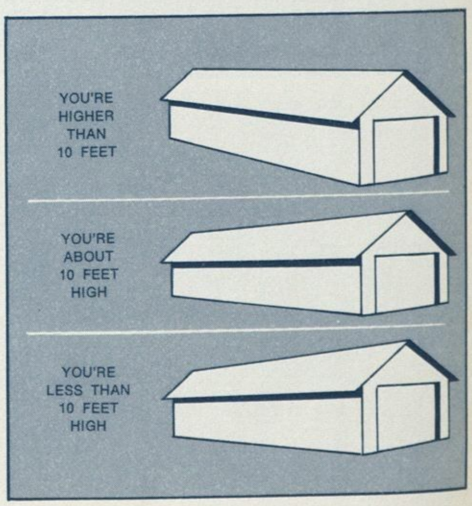
True parallel lines never meet, but they appear to form an angle to each other, according to the position of the viewer. This fact may be used by pilots to help estimate their height above the runway when landing at unfamiliar airports, and prevent accidents.

A knowledge of exactly when to begin the flareout on landing is something that comes only with experience. But even pilots with hundreds of hours on the logbook sometimes misjudge their distance above the runway when landing at unfamiliar airports. About 450 accidents a year in general aviation are ascribed to "improper level off."

At many small or medium sized airports, where hangars are in clear view and lie parallel to the runway, the art of perspective can assist the pilot in estimating his height above the runway when the time arrives where he must trust his eyes rather than his altimeter. The roof eaves of most general aviation hangars are about 10 feet high. By observing the angle of the eave, with respect to his airplane, the pilot can have a pretty good idea of when to flare.

For example, if the eave appears to be running parallel with the ground, the landing airplane is about at the same height as the eave. If the line of the eave seems to point somewhat skyward, the plane is above the eave. If the eave line points down, the plane is less than eave height.

Obviously the proper height for flareout will vary with aircraft type and landing conditions, as indeed the exact height of hangar eaves will vary somewhat. However, using the eave line as a reference in the manner described above may prevent the kind of gross error that results in "landing" 15 feet off the ground, or inadvertently plowing the runway with the nose gear. ■



Airborne Ache

Barodontalgia is not the kind of word you toss around in casual conversation, but if you are a pilot it could very easily be at the tip of your tongue—at a time and place where you are in no position to do anything about it.

Barodontalgia, pronounced *bear-ō-don-tal'-je-ah,* is an airborne toothache which commonly makes its painful presence known at altitudes above 5,000 feet. Differences in barometric pressure may cause sufficient pain from a number of dental and oral conditions to interfere with piloting duties.

One cause is air at ground-level air pressure trapped within cavities in tooth walls. Pain arises from the effort of this trapped air to equalize with lower altitude pressure. As the airman ascends to altitude, the expanding air within its confining tooth capsule exerts pressure on tooth pulp and root canal. Experiments in Air Force altitude pressure chambers have demonstrated that pressure within the tooth can loosen fillings and cause them to come out.

Not all dental pain caused by altitude is acute. Indeed, the altitudes at which most general aviation pilots fly—10,000 feet or lower—are more likely to produce a dull ache, unless a major and obvious dental problem exists. Tooth pain at altitude can generally be traced to one of two dental conditions: inflamed dental pulp, which contains the nerve and blood supply of the tooth; and cavities or cracked fillings. Pain symptoms should be discussed with a dentist as they occur and not allowed to persist. The possibility exists that the condition could become suddenly aggravated, diverting the pilot's attention from the control of his aircraft.

A dull toothache at altitude can also be caused by pyorrhea, more exactly called "lateral periodontal abscess." In this condition, the tooth itself is sound, but the surrounding tissue is diseased.

Sinus "Toothache"

Similarly, "toothache" at altitude can sometimes be traced to an adjacent structure in the head. The large sinuses on either side of the skull, just above the upper rear teeth, could be the source of the "toothache." In fact, this is a likely source of tooth pain in persons with a history of sinusitis. This fact should be brought to the attention of the dentist, who may refer the patient to a physician.

Where an obvious or hidden dental or related condition exists, discomfort rising to pain occurs as the airplane climbs—and it decreases with descent. Relief in most cases can be obtained by flying at a lower altitude. The onset of pain on the climb has a positive side—it means the tooth is still alive and the nerve and blood supply have not yet been destroyed. The fact that the pain occurred, however, should be a warning to consult a dentist.

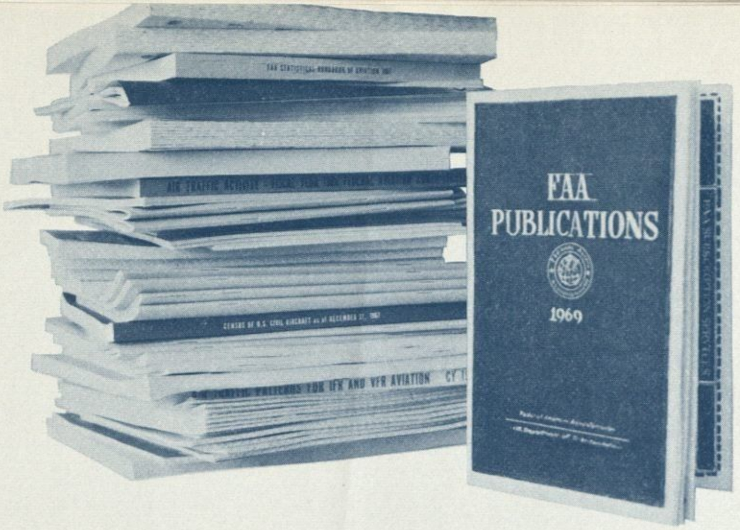
Whenever dental work is done, it is a good idea to ask the dentist if there is any restriction on flight. In some cases, it is wise to stay on the ground for at least three days. When extensive restoration, involving very large and deep-seated silver fillings, has been done, it might be weeks before vital tissues become stabilized.

Certain medication, particularly sedatives and local anesthetics, call for definite control of post-treatment activities. This is a matter for the Aviation Medical Examiner to decide.

Bleeding following treatment, particularly for gum disorders, is also a possibility that would make flight unwise for a period of time.

A thorough dental examination at least twice a year—and oftener, if indicated—is the best way to avoid tooth problems aloft. Normal oral hygiene, such as frequent tooth brushing, is the foundation of good oral health. While it is not always possible to brush after eating, excellent results can be obtained by rinsing the mouth vigorously, promptly and thoroughly soon after eating. The first 15 to 20 minutes after eating are the most critical for acid formation. When the acid is neutralized or reduced by brushing or rinsing, one of the primary causes of tooth decay is prevented.

Dental troubles do not always happen with startling suddenness—they often signal their onset long before pain becomes acute. Treatment should be obtained as soon as practicable. ■



NEW CATALOG of FAA PUBLICATIONS

_____ FAA 5.12:965 (SSTC)	SUMMARY OF SUPPLEMENTAL TYPE CERTIFICATES. Nov. 1965. *$9.00 domestic; $3.50 additional for foreign mailing.*
_____ FAA 5.15:965 (AIR)	*Acceptable Methods, Techniques and Practices:* AIRCRAFT INSPECTION AND REPAIR. 1965. AC 43.13-1. *$3.00 domestic; $1.00 additional for foreign mailing.*
_____ FAA 5.16:965 (AALT)	AIRCRAFT ALTERATIONS. 1965. AC 43.13-2. *$2.00 domestic; 50¢ additional for foreign mailing.*
TD 4.9: (AVN)	FAA AVIATION NEWS. Issued Monthly. *$2.00 a year domestic; 50¢ additional for foreign mailing.* _____ one _____ two or _____ three years
_____ TD 4.10/2:969 (ADS-1)	*Summary or Airworthiness Directives:* VOLUME 1, SMALL AIRCRAFT. Jan. 1969. *$7.25 domestic; $1.50 additional for foreign mailing.*
_____ TD 4.10/3:967 (ADL-2)	VOLUME 2, LARGE AIRCRAFT. Jan. 1967. *$6.00 Domestic; $1.25 additional for foreign mailing.*
TD 4.11: (IN)	INTERNATIONAL NOTAMS. Issued Weekly. *$5.00 a year domestic; $2.25 additional for foreign mailing.* _____ one _____ two or _____ three years
_____ TD 4.12:Pt 1/ (BFAP)	*Airman's Information Manual:* PART 1—BASIC FLIGHT MANUAL AND ATC PROCEDURES. Issued Quarterly. *$2.50 a year domestic; 75¢ additional for foreign mailing (subscription accepted for one year only).*
_____ TD 4.12:Pt 2/ (ADP)	PART 2—AIRPORT DIRECTORY. Issued semiannually. *$4.00 a year domestic; $1.00 additional for foreign mailing (subscription accepted for one year only).*
_____ TD 4.12:Pt 3/ (ODNA)	PART 3—OPERATIONAL DATA AND NOTICES TO AIRMEN. Issued Biweekly. *$18.00 a year domestic; $5.00 additional for foreign mailing (subscription accepted for one year only).*
_____ TD 4.15:967 (AS)	AIRCRAFT TYPE CERTIFICATE DATA SHEETS AND SPECIFICATIONS. Reprinted April 1967. *$20.00 domestic; $5.00 additional for foreign mailing.*

A CATALOG listing FAA publications of interest to airmen, mechanics, the aviation industry and the aviation-minded public will be available without cost early next month.

The list includes some 120 different items, ranging from how to build an airport to how to pass a parachute rigger's examination. Many of the publications listed are available free of charge from FAA; others can be purchased by mail, at nominal prices, from the Government Printing Office. Most entries fall into five main categories: airports; aviation education; examination guides; flight information; and training manuals.

The catalog includes prices, instructions for ordering and order forms which speed up delivery service. Separate order forms are supplied for subscription items, such as the *Airman's Information Manual*, or the *Summary of Airworthiness Directives;* and for single issue pamphlets, such as the *Student Pilot Guide* or the *Personal Aircraft Inspection Handbook*.

A sample order form for subscription items is provided herewith and may be used by detaching pages 8 and 9 and mailing to GPO (add one-fourth of the price for addresses abroad).

To obtain a copy of the catalog, request "FAA Publications." Include your name and address on a mailing label, and write "FAA Publications" on the outside of the envelope. Send your request to: Distribution Unit, TAD 484.3, Transportation Department, Washington, D.C. 20590.

For speedy service, follow instructions. ■

_______ TD 4.15/2:968 (EPS)	AIRCRAFT ENGINE AND PROPELLER TYPE CERTIFICATE DATA SHEETS AND SPECIFICATIONS. Reprinted 1968. *$16.00 domestic; $4.00 additional for foreign mailing.*
_______ TD 4.308:F 64 (FSH)	FLIGHT SERVICES, 7110.10. April 1, 1969. *$9.00 domestic; $2.50 additional for foreign mailing.*
_______ TD 4.309:17 (IFIM)	INTERNATIONAL FLIGHT INFORMATION MANUAL. Vol. 17, April 1969. *$3.00 domestic; 75¢ additional for foreign mailing.*
_______ TD 4.310: (LOID)	LOCATION IDENTIFIERS, 7350.1. Issued 3 times a year. *$6.00 a year domestic; $1.25* additional for foreign mailing (subscription accepted for one year only)................
_______ TD 4.409:968 (GAIS)	GENERAL AVIATION INSPECTION AIDS SUMMARY. August 1968. AC 20-7F. *$3.00 domestic; 75¢ additional for foreign mailing.*

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Modern Bellanca "Viking" has all-wood wing.

WOOD and WINGS

WOOD has a long and respectable tradition in aircraft construction, going back to the gliders that preceded the earliest attempts at flight. Nor is the day of wood construction past—at least one U.S. manufacturer is currently producing a line of airplanes with wooden wings. The wood spars and ribs are covered with plywood, which in turn is sheathed with a synthetic fabric, producing a strong, lightweight wing and an extremely smooth airfoil.

Considerable numbers of wood and fabric aircraft are still being produced in Europe, notably England, France and Germany.

There are also nearly 3,000 amateur-built airplanes, most of which were made largely of wood and fabric, in active flying status in the United States. Their number grows at the rate of about 300 a year. The number of older factory-made wooden planes still navigating the airways is not precisely known, but it is probably well up in the thousands.

The twilight of the age of wooden airplanes began at the close of World War I, when the Germans first introduced mass-produced aircraft with tubular steel fuselages. The Germans also developed two *all metal* airplanes in World War I. One was the Junkers J.1 which was all *steel*, including the skin, and was so heavy it barely flew. Only the prototype was built. More successful was the Junkers J.4, the first all-metal airplane used in actual warfare. Heavily armored, it was used for ground attack. There is no record of any J.4 being shot down.

Twenty-five years later, in World War II, a reversal took place. Desperate for aluminum, the Germans developed the 522 mph. jet-propelled Heinkel HE 162 which had all-wooden wings. Also made of wood were the wings on the rocket-powered German BP-20, which could reach 600 mph. at 16,000 feet.

The Allies in World War II were not without their own wooden aircraft, probably the most famous being the plywood de Havilland *Mosquito* which was in the 400 mph class and served as a fighter-bomber, escort fighter, and unarmed photo-reconnaissance plane. The U.S. produced the Cessna T-50, and the Beech AT-10, both all-wood trainers. The latter had wooden gas tanks, made leak proof by a plastic film lining. Vultee Aircraft produced 11,784 trainers which were largely made of wood.

Largest All-wood Aircraft

World War II also produced the "Spruce Goose," Howard Hughes' fantastic flying boat, made entirely of plywood. Originally planned as an all-metal plane, the anticipated aluminum shortage forced designers to turn to wood. Known originally as the *Hercules* and later as the H-4, the aircraft has (it is still in existence at Long Beach, Calif.) a wing span of 320 feet and a hull 220 feet long. The "Goose" weighs 200 tons-plus, and is powered by eight engines. It is the biggest wood aircraft ever built. Aside from a lift-off in taxi tests, the H-4 has never flown.

On a weight-to-strength ratio, wood compares very favorably with steel, duraluminum and magnesium, the metals most commonly used in aircraft construction. Wood is less efficient by only a few percentage points. This requires a bit of explanation: by itself, a piece of wood is no match for metal, but when assembled into a *structure* —stringers, longerons, formers, ribs, spars —to form a unit, the difference in strength diminishes and wood is almost identical to metal in strength.

Wood is a desirable aircraft material because of the ease with which it can be worked. No expensive hydropresses, routers, riveters, drop hammers, etc., are needed. Simple carpenter hand tools, plus home-made jigs and fixtures, are all that are needed to turn out a fully certificatable aircraft. Field repairs present no serious problems.

The quality of wood used in aircraft construction is established by FAA and other government agencies, with characteristics and specifications detailed in Advisory Circular AC 43.13-1, "Acceptable Methods, Techniques and Practices: Aircraft Inspection and Repair." (Available for $3.00 from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402).

Wood used in aircraft structures must meet standards on moisture content, grain characteristics, type and number of knots for a given dimension, pitch pockets, mineral streaks, checks, shakes and splints. Determining what is acceptable is a job for an expert. Aircraft quality wood is so marked.

Spruce became the wood of choice among aircraft builders because it provides the optimum strength-to-weight ratio, compared to other woods. Noble Fir, Douglas Fir, Western Hemlock and White Cedar are stronger than spruce but heavier. Nearly matching spruce's weight/strength ratio is Northern White Pine and Yellow Poplar, both widely used in aircraft construction.

The raw lumber is used in three forms in aircraft construction—solid wood, plywood, and laminated wood. In some cases, pressure and chemical-treated wood is also used for specialized purposes.

With the exception of a relatively few items of hardware, wood airplanes are almost entirely glued or bonded together. During the assembly, thousands of small nails and brads are used, but these can be removed after the glue hardens, at no sacrifice of strength.

Aircraft glue is not to be confused with common fish and hide glues which are totally unsuitable for aircraft fabrication. These deteriorate rapidly, have low strength and are difficult to apply.

Aircraft glue development has come a long way from the casein adhesives used in pre-World War I and subsequent aircraft up until the early '40s. While casein is still used, it is gradually being edged out by resin glues which are not onlv stronger, but are absolutely waterproof and impervious to attacks by mold and fungus.

Among the newer glues are resorcinol-formaldehyde; melamine-formaldehyde; urea-formaldehyde; and "fortified" urea-resin. They are not limited to aircraft manu-

facture but they have a wide application in the wood fabrication industry, and are readily available.

Good Design Vital

Proper design, allowing for free ventilation, drainage, and access to points where moisture is likely to accumulate, is as important as the craftsmanship and materials going into the aircraft. Inspection plates and "peep holes" should be provided so that interior examination of spars, bulkheads and compartments can easily be made.

Wood is vulnerable to concealed damage by wood-eating insects, moisture, and microscopic fungi spores. Insects reveal their presence by tiny holes and minute deposits of chewed wood—sawdust. Some insects can actually be *heard* as they go about their destructive work. Gentle probing with a dull knife point around suspected areas will reveal the extent of the infestation and consequently the amount of destruction. Wood properly treated with a sealer such as varnish or a resin mixture during the aircraft assembly process, or following repairs, is protection against insect damage.

Wood that appears to be perfectly dry sometimes crumbles to the touch or light pressure. Since there is no evidence of moisture, the assumption is natural that some mysterious process, not related to moisture, has destroyed the wood. In point of fact, *rot* can set in even in the absence of moisture. Rot is caused by fungi.

Fungi spores are wafted through the air in a continuous, invisible stream, everywhere. They settle on everything, including wood. The spores can remain dormant for extended periods of time—one, five, or ten years—and come to life when conditions are right.

The most suitable environment for the spores to germinate is about 70° F., when the wood is damp. For growth the fungus needs a mild temperature. The resurgent spores penetrate the wood with vein-like roots which feed off the wood's cellulose, leading to its destruction.

Fungus is Destructive

The deterioration is subtle, and can remain hidden until disaster overtakes the plane unless regular, careful inspections are made. As the fungus is developing, the infested wood darkens and there is evidence of warping, shrinkage, and cracking taking place.

In the final stages, the fungus "fruits" as a mushroom, puffball or the leathery growths seen on dead trees.

It has been estimated that a mushroom three inches in diameter may give off one to two *billion* spores, each capable of starting the destructive cycle all over again.

Paint and varnish will not prevent rot, nor will it "cure" it, since paint and varnish deteriorate with age. Indeed, the vegetable oils in some paints provide nourishment for fungus growth.

The most effective way to eliminate rot is to keep the wood dry—the moisture content should not exceed 20 per cent. Moisture content for aircraft grade wood is 12 to 15 per cent. This degree of dryness is assured by the quality controls placed on aircraft grade woods, but the day-to-day moisture content found in the wood members of an aircraft changes with the weather.

Moisture also penetrates the aircraft in the form of rain or snow entering through poorly fitted doors, stabilizer slots in the fuselage, through wing strut and aileron cable holes. It is spun into wheel wells when operating from wet or snow covered runways or muddy fields. Condensation forms in poorly ventilated places, creating an alternately wet and dry atmosphere ideal for rot to develop. Plugged or non-existent drain holes provide standing reservoirs of water.

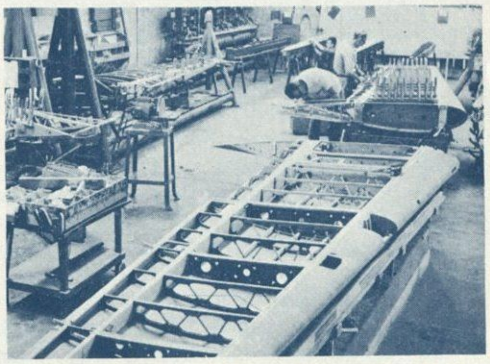
Unless a pilot is a certificated airframe mechanic he is prohibited from doing any repair work, however minor, on wood structures. His best defense against rot and insect damage is vigilance—and taking care of his airplane.

A wood airplane should be hangared, more so than a fabric-covered metal-framed aircraft. Even though the wood is treated with several coats of varnish, time and the action of airborne chemicals cause the varnish to deteriorate. Hair-line cracks admit moisture, opening the door to rot. Metal fittings in contact with wood invite rot, and these should be carefully inspected for rust stains.

Whenever rotting is suspected, or when there is a suspicious bulge or evidence of internal damage due to impact, a qualified mechanic should be consulted. If there is damage, it won't go away by itself, and waiting for the next inspection might be too late.

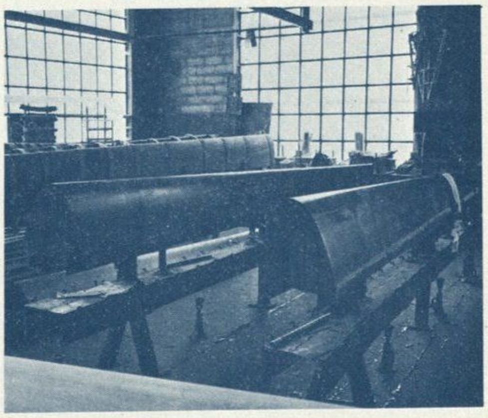
Wood remains an excellent aircraft material. How well it performs depends on sound design and conscientious maintenance. The latter begins with the pilot or owner. ■

Strength of all-wood rib compares favorably with metal construction. Below—all-wood wing combines strength with light weight and ease of construction.



(Photos: Bellanca Aircraft Corp.)

Applying plywood skin is a team effort. Surface will later be covered with dacron. **Below**—plywood leading edge is held firmly in place on the ribs by straps on the jig.



Famous

FLIGHTS

Army Air Corps Capts. Carl J. Crane, George V. Holloman, and civilian electronic engineer Raymond Stout with the Fokker C-14B they used to make the world's first fully automatic landing, August 23, 1937 at Wright Field, Ohio.

Just as he had done in dozens of practice sessions, Capt. George V. Holloman, U.S. Army Air Corps, extended his left hand and flipped a makeshift switch on the lower edge of the instrument panel. He took his feet from the rudder pedals and released his hold on the stick. The big Fokker C-14B wobbled for a moment and the rudder pedals seesawed gently back and forth while the stick leaned slightly to the left and then gradually returned to a centered position.

The huge plywood wings of the Army transport tilted as the aircraft swung into a slow deliberate turn to the left, back toward Dayton's Wright Field where the plane had taken off only moments before. Captain Holloman was not alone in the aircraft—in the roomy cabin below and forward of his open cockpit, Capt. Carl J. Crane and civilian electronic design engineer Raymond Stout sat tense and expectant as *the aircraft banked without human guidance*.

Just a few degrees short of turning 180° the aircraft steadied and took up a course for Patterson Field, a mile to the east of Wright Field. No one aboard the plane touched either the engine or the aircraft controls, but all eyes were riveted to the instrument panel when they were not scanning the rolling Ohio countryside 500 feet below.

Aviation Milestone

It was late in the afternoon of Aug. 23, 1937, and the three men aboard the Fokker were within minutes of establishing a major milestone in aviation. Their plane, a giant for the era, was attempting to set them down safely on the sod surface of Patterson Field with the world's first fully automatic landing. This "hands and feet off" landing is not to be confused with the first "blind landing" (visibility totally obscured), which was accomplished by James H. "Jimmy" Doolittle on Sept. 24, 1929.

The search for a fool-proof, fully automatic landing system that would bring an aircraft in for a safe landing is almost as old as flying itself. As early as 1907 the Wright brothers had a patent on a device that would stabilize an aircraft in flight—the first requirement for an automatic landing.

In 1914 Lawrence Sperry, who with his father Elmer perfected the airborne gyroscope, demonstrated an operational autopilot in Paris. While thousands gaped skyward, Lawrence stood in the open cockpit of a Curtiss flying boat, arms upraised, as it flew over the Seine. As if this were not enough, his mechanic clambered out of the cockpit and walked through the maze of struts and wires to the wing tip, putting the autopilot to the ultimate test.

Carl Crane began to tinker with radio control of aircraft while at Randolph Field, Texas in the late '20s. In 1932 he was transferred to Panama where he continued to experiment with electronic control of flight.

In Panama the broad outlines of how this could be done with radio impulses began to take shape. His first chance to put his ideas into hardware came when he was assigned as chief of the instrument and navigation laboratory at Wright Field in 1934.

Crane soon made the acquaintance of Holloman and Stout, two members of the lab who shared his interest in automatic landings. Next on the agenda was the highest hurdle of all—getting the money to put wings to their dream.

With considerable misgivings they drew up a set of requirements for their system, cutting costs wherever they could. Their carefully pared figures added up to what they considered a staggering sum. They would need $24,000, they said in their written proposal: $10,000 for materials, $5,000 for engineering and drafting labor, $5,000 for fabrication labor, and $4,000 for testing. To their surprise, they got the money, plus the use of an airplane, a Fokker C-14. The single-engine Fokker had seen better days and many hard landings, but the trio was sure they could coax a few more hours out of her tired frame.

While the theory of automatic landing was well known and its feasibility acknowledged by engineers, the problem boiled down to devising the actual hardware—the mechanical "feet and hands" that would respond to radio signals and airplane attitude with sufficient delicacy and coordination to enable the plane to land without human intervention.

With the exception of the Sperry gyropilot, all the electro-mechanical units used in the automatic landing system were designed by Crane, Holloman, Stout, and a newcomer to the team, Constantine D. Barbulesco.

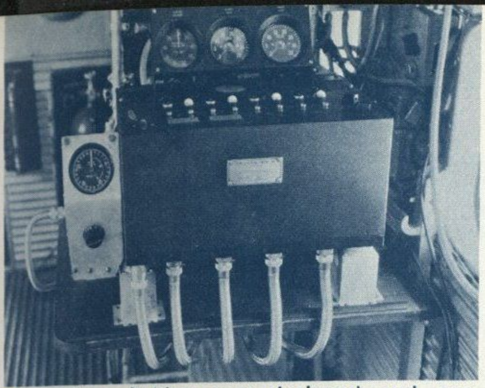
For directional control, the group developed an air-driven servo control, which later was called a radio compass-gyro pilot relay. Drift was compensated for by an electro-mechanical compass loop rotator, also devised by the team. They developed an automatic altitude selector which controlled engine power and a throttle engine which would regulate power to keep it within pre-set limits of climb and descent.

They also developed an automatic frequency selector and changer for the radio compass and ground contactor throttle locks which shut down the engine after the aircraft touched down and was in its landing roll.

Just Another Day

The day of the history-making flight was little different from any other at busy Wright Field. Crane was working at his desk when Holloman and Stout burst in, somewhat out of breath. They had the thing "nailed down" they said.

The three of them went out to the plane and climbed aboard. With no fanfare, not even a public announcement, and only small mention to those at Wright Field, the trio took off and began an approach to Patterson Field.



Electronic switching gear designed and constructed by Crane, Holloman and Stout controlled air speed, engine speed, altitude and vertical speed adjustments.

There were five beacons used in the flight. These were arranged in a line describing a straight path toward the center-line of the runway. The last two were located on the field: one at the threshold, the other at the opposite end. The radio compass in the aircraft switched automatically as the plane passed a marker beacon and automatically tuned to home in on the next beacon.

When the aircraft passed the third beacon, the throttles retarded automatically to achieve a gradual rate of descent, leveling off at 200 feet. When the plane passed the threshold beacon, the throttles were again retarded, giving the aircraft a 400-feet-per-minute rate of descent. This was maintained until the plane touched down, at which point a switch actuated by the weight of the plane cut the throttle to idle. The Fokker rolled to a stop and awaited further instructions.

Won Mackay Trophy

For their pioneering efforts, Carl Crane and Holloman were awarded the Mackay Trophy, one of the highest aviation awards. Both men also received the Distinguished Flying Cross and were eventually promoted to Colonel.

George Holloman was killed in a B-17 crash in 1946 on Formosa while enroute from Shanghai to Nichols Field, Manila. Holloman AFB, N.M. is named in his honor.

Carl Crane retired from the Air Force 1949, and now heads his own avionics firm in Helotes, Tex.

Thanks to pioneers like Crane, Holloman and Stout, automatic landings will soon be routine. FAA has made several thousands in test programs at its National Aviation Facilities Experimental Center in New Jersey, and British and French governmental research teams have accomplished a like number. FAA has already certificated three and four engine jet air carrier aircraft for automatic landing, and some airlines, both here and abroad, have started making them with passengers on board.

At the moment, automatic landings are being made in good weather only, but the day is not far off when aircraft will be landed in the heaviest types of fog, unassisted by human hand or eye.

FRANK J. CLIFFORD

Pilot BRIEFS

• LARGE, HEAVY WATER FOWL are on the wing again migrating in large numbers from their Canadian summer breeding grounds to wintering areas on the Gulf and the Eastern Coast. The principal routes are along the Atlantic Shore, Mississippi River, Rocky Mountains and Pacific Coast flyways. Pilots are advised to be especially watchful from mid-October through November, and to check the Airman's Information Manual for special routes, dates and good pilot practices. During 1968, pilots reported 529 bird strikes, and 640 strikes in 1967, with only minor injuries.

• A $500 SCHOLARSHIP LEADING TO A HELICOPTER RATING awaits the woman pilot who best meets the criteria of the third Doris Mullen Whirly-Girls Scholarship, named after Mrs. Doris Mullen who was killed in an airplane accident in 1966. Sponsor is the Whirly-Girls international organization of women helicopter pilots. Applicants must hold a current pilot license, must intend to use the 'copter rating to further involvement of women in aviation, and must require financial assistance to obtain a 'copter rating. The award will be made in January 1970. Applications must be received by Oct. 1, 1969. Application forms may be obtained from The Whirly-Girls, Suite 700, 1725 DeSales Street, N. W., Washington, D. C. 20036.

• COMPASS CALIBRATION PADS -- their design, location and use -- are described in FAA's new Advisory Circular AC 150/5325-8. Included in the nine-page pamphlet is a brief description of "compass swinging" techniques, line drawings and dimensions of typical pads, materials suitable in pad construction and effect of nearby structures and magnetic forces. AC 150/5325-8 is available free from the Federal Aviation Administration, TAD 484.3, 800 Independence Ave., S.W., Washington, D.C. 20590.

• MISSING PLANES. Pilots have been alerted to look out for missing aircraft by a new addition to the Airman's Information Manual which gives aircraft identification, type and color, proposed route of flight, last known position and other pertinent information. The first list appeared in Part 3A of the June 26 edition of the AIM, which is published twice a year. The list will also be posted continuously in FSSs.

• A PARACHUTE THAT GOES UP as well as down—intended to provide a lifesaving difference for pilots who bail out over hostile terrain or unsuitable landing areas—has been proposed by the Goodyear Aerospace Corp. Called the Pilot Airborne Recovery Device (PARD), the device incorporates a plastic balloon and a standard parachute. After bailout, with the chute deployed, the pilot would be able to inflate the balloon with heated air and soar upwards as high as 10,000 feet. Various techniques for rescuing the pilot or towing him to a safer landing area are associated with the project, contracted for by the Air Force.

CARIBBEAN PACKET WITH 5 CHARTS NOW AVAILABLE

Pilots flying in the Caribbean area now have available in a single package a new set of IFR charts and flight information.

The packet includes three sheets with five enroute charts and a selection of area charts, along with a detailed information supplement which provides greatly expanded information on airports, radio navigation facilities, communications, special operations and emergency procedures in the Caribbean.

The back-to-back charts cover the area from San Diego to Mexico City, and from Mexico City to Panama. Charts also cover segments of the U. S. and Mexico which border on the Gulf of Mexico as far south as Cuba and Yucatan, Miami-Nassau, Puerto Rico, Mexico City, Guatemala City, the Panama area, and Jamaica.

The new package, which retires the civil Miami-Nassau-Puerto Rico chart, will be completely updated every 56 days. For addressees in the U. S., Canada, Mexico, Panama and Puerto Rico, the annual subscription is $10.20; all others, $14.75.

Subscriptions can be entered at any Coast and Geodetic Survey sales office or the Distribution Division, C-44, Coast and Geodetic Survey, Rockville, Md. 20852. Orders must be accompanied by check or money order made out to "C&GS, Department of Commerce."

"FLIGHT STIMULATOR" Busy Congressmen can now log flight time without even leaving Capitol Hill thanks to the Link trainer Congressional Flying Club President Don H. Clausen has installed in his office. House Minority Leader Gerald Ford, Mich., takes a turn, supervised by Mr. Clausen, Calif. (far left), and House Speaker McCormack.

London to Australia Air Race Set For January

What is being described as probably the longest and most adventurous air race for light aircraft in the past 30 years, a flight from London to Sydney, Australia, is now in the final planning stages.

The race is open to all categories of aircraft weighing 18,000 pounds or less, with the exception of airliners or current model, high-performance military aircraft. Still under discussion is the inclusion of a helicopter category.

The race will commemmorate the 50th anniversary of the first flight from England to Australia, made in a World War I Vickers *Vimy* bomber by Sir Ross and Sir Keith Smith in 1919.

Complete details may be obtained by writing to Aircraft Owners and Pilots Association, P.O. Box 5800, Washington, D.C. 20014, or the National Aeronautics Association, 15th and H Streets, N.W., Washington, D.C. 20015.

FAA to Test Effect of Big Planes on Airport Surfaces

Looking forward to the day when jumbo jets such as the Lockheed C-5 and the Boeing 747 become commonplace, FAA, the Air Force, and the Army have joined forces to study the effects of very heavy, multi-wheeled aircraft on airport pavement.

While pavement surface unit loads are less for the C-5 than some lighter aircraft, soil loading at depth is greater because of the aircraft's heavier weight. The study will also supply the Air Force with new basic information on the effect of high gross loads widely distributed through multiwheel landing gear on rigid and flexible pavements.

For the tests, the Air Force will use a full scale load cart with wheels and tires spaced to simulate one side of the C-5 main landing gear (two 6-wheel landing gears, mounted fore and aft, totaling 12 wheels). Wheel loads will approximate maximum gross weight of the C-5.

Expected completion date: summer 1970.

Aircraft Noises and Sonic Boom To Be Studied Under FAA Contract

Sonic boom and aircraft noises are the subjects of five studies recently contracted for by FAA. The total cost is $528,635.

Under a $107,762 contract, the Rohr Corporation, Chula Vista, Calif., will study the economic feasibility of retrofitting commercial jet transports with acoustically treated engine nacelles and ducts. Low bypass turbofan engines used in Boeing 707, 720, 727, 737, and Douglas DC-8 and 9 aircraft are involved.

The effect of unusual aircraft noise, including sonic boom, on special population groups will be studied by the Stanford Research Institute, Menlo Park, Calif., under a $129,893 contract. A related $63,328 contract went to Wyle Laboratories, Huntsville, Ala., for a study and test program on the effect of sonic pressure waves on glass structures.

In addition to aircraft noises, the above two studies also will analyze the effect of pressure waves generated by various environmental conditions such as tornado and hurricane frequency and wind.

McDonnell-Douglas Corp., Long Beach, Calif., will study sonic boom effects under a $140,575 contract, and General Applied Science Laboratory, Westbury, L. I., will also study sonic boom effect under contracts totalling $87,077.

The sonic boom studies will be used by FAA to establish future sonic boom certification standards for civil supersonic aircraft as required by Public Law 90-411.

O'Hare, Nation's Busiest Airport, Had 690,810 Operations in 1968

Chicago's O'Hare International Airport retained its title as the nation's busiest airport in 1968, with 690,810 operations compared with the 594,486 logged by runner-up Los Angeles International.

Others in the top ten are: Van Nuys, Calif., third, for the second year in a row, with 567,973 operations. Opa Locka, Fla., skidded from second place in 1967 to fourth in 1968, with 563,618 operations. Fifth place went to Fort Lauderdale, Fla., with 517,848 operations.

Santa Ana, Calif., a newcomer to the top ten, leaped from 13th to sixth, with 512,973 operations. Long Beach, Calif., ended the year in seventh place with 496,917 operations, and John F. Kennedy, in eighth with 465,120 operations. Minneapolis Flying Cloud, Minn. was ninth with 446,198 operations and Tamiami, Fla. brought up the rear with 438,916 operations.

For more detailed data see FAA Air Traffic Activity Report, 1968, available for $1.75 from tht Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

• Navy Training for Mechanics

At the present time I am serving with the U.S. Navy as an aviation structural mechanic (safety equipment) and I am interested in later employment with a civil airline.

Would the technical training I received in the Navy qualify me for such employment? Also, what are the requirements for an FAA airframe and/or powerplant mechanic certificate? Can I obtain one while still on active duty?

N. T. St. O.
Patuxent River, Md.

An applicant for an FAA mechanic certificate and rating must be a graduate of an FAA-certificated mechanic school, or he must submit satisfactory evidence of at least 18 months' experience for either the powerplant or airframe certificate, or 30 months' experience for the combined ratings. When an applicant meets the experience requirements, he is eligible to take the written, oral, and practical tests.

Any military mechanic meeting these requirements is eligible to take the tests. Candidates should write or visit the nearest FAA office. In your case this would be the Flight Standards District Office, West Building, Rm: 152, Washington National Airport, Washington, D. C. 20001. Phone: 202-NA 8-1555/6/7.

• Spiral Dive Warning

Reference is made to your article on FAA's study of spiral dive characteristics of small jet aircraft (February *FAA AVIATION NEWS*).

It would seem to me that an attitude instrument the same as, but independent of, the panel flight attitude indicator, would solve the problem.

When the aircraft's pitch and bank attitude became critical enough to induce a spiral, this independent instrument would sound an alarm to alert the pilot of approaching danger before the actual spiral began.

Earl E. Warthan
Grand Prairie, Texas

A warning system such as you suggest could probably be incorporated into an aircraft's existing attitude instruments, thus reducing the cost. However, the warning system would have to be designed so that it could be made inoperative in VFR condition when the pilot would be intentionally maneuvering the aircraft to attitudes which could trigger the warning system.

Your suggestion will be passed on to the group engaged in FAA's spiral dive research study.

• Takeoff Minimums

The new instrument charts specify takeoff minimums as one mile for single engine aircraft. Do these minimums apply to all aircraft, or only to aircraft carrying passengers for hire?

Arthur Spieler
Huntingdon Valley, Pa.

The takeoff minimums of FAR 91.116(c) apply only to aircraft operating under FAR 121, "Certification and Operations: Air Carriers and Commercial Operators of Large Aircraft"; FAR 123, "Certification and Operations: Air Travel Clubs Using Large Airplanes"; FAR 129, "Operations of Foreign Air Carriers"; or FAR 135, "Air Taxi Operators and Commercial Operators of Small Aircraft."

• Taxiway A-B-Cs

Has FAA given any thought to letter-number designations of taxiways, intersections, and parking areas? Taxiways could be "A", "B", etc., with "N", "E", "S", "W", added for direction of travel on the taxiway.

Runway intersections with taxiways could have the same name as the taxiway according to size and direction. Large parking areas could be divided according to tiedown streets and assigned numbers which would be suffixed to the letter of the taxiway feeding the area.

I think such a system of marking would be of great help on large airports where some FBOs have parking areas a half-mile long. When a FBO has 150 aircraft on the lot, saying, for example, that "Cessna N12344C is at Airways" is about as specific as saying the plane is "over there."

C. W. Morrow III
Reseda, Calif.

Standard markings for taxiways are described in FAA Advisory Circular AC 150/5340-18 "Taxiway Guidance Sign System". The circular provides that if the number of taxiways exceeds the 26 letters available, double letters such as "A-A" will be used. These markings have been found adequate for most airports over the years.

Marking and identifying specific spots on a large parking apron is not covered by the advisory circular. FAA feels that the responsibility for the operation of these ramp and apron areas belongs to airport management.

• "Seaplanes" Wanted

I have just received my June *FAA AVIATION NEWS* and I would like to say your article "Liquid Runways" was good, but long overdue. We do need more seaplane bases.

On another matter, do any of your readers have a copy of "Seaplanes" by Daniel J. Brimm Jr., copyrighted in 1937 by Pitman Publishers, Inc.? I would like to buy a copy.

Donn Booth
19 Otter Creek Place
Cortland, N.Y. 13045

• Sensitive Altimeters

The *Flight Forum* department in *FAA AVIATION NEWS* is always interesting and instructive. Perhaps other readers would like

FAA Aviation News welcomes comments from the aviation community. We will reserve this page for an exchange of views. No anonymous letters will be used, but names will be withheld on request.

to learn the exact meaning of the word "sensitive" as it is used in "sensitive altimeter."

Can you help with a definition?

J. E. Wilcox
East Williston, N. Y.

Most barometric altimeters now in use are "sensitive." That is to say that they are equipped with a knob by which the altimeter can be adjusted to standard atmosphere pressure, which is 29.92 hg, or to the local station atmospheric pressure.

• Author's Quest

I am doing research for a biography of Alaska aviation pioneer Noel Wien. Anyone having material or anecdotes and/or who is willing to be interviewed about Wien is invited to write to me.

Ira Harkey
2610 Charing Road
Columbus, O. 43221

• Coverall Career

I would like very much to become an airframe and powerplant mechanic, but I need more information about the trade.

What is the average income of an A&P? What are my chances for employment? What are the names and address of the best schools?

Bert Cannella
Cookeville, Tenn.

Aircraft mechanic wages vary in different parts of the country and are also governed by the kind of ratings held, experience, and the employer. Generally speaking, airlines pay the highest rates.

On the East Coast the average hourly starting rate for A&Ps is approximately $2.50. Experienced men get up to $5.00 an hour; the airlines average is approximately $4.50.

The employment picture is good. There is always a need for experienced aircraft mechanics. A letter to the personnel departments of the major airlines and the large repair stations should provide you with specific information and the company's hiring policies.

FAA does not recommend any specific schools, products or services. However, Advisory Circular AC 147-2E, "FAA Certificated Mechanic School Directory", lists the certificated A&P schools in the 50 States and Puerto Rico. The circular is available free of charge from FAA, Department of Transportation, TAD 484.3, Washington, D. C. 20590.

Finally, the Army, Navy and Air Force all have excellent aircraft maintenance technician schools. A visit to the local recruiters will provide you with full details.

• Don't Gamble With Gimbals

What is the advantage of caging the directional gyro prior to landing and during taxiing?

Student
Frostburg, Va.

All gyro instruments depend on a spinning rotor suspended in gimbal rings which allows it to swing freely. The pivot points rotate in bearings rugged enough for in-flight use, but vulnerable to damage during hard landings and taxiing on rough terrain.

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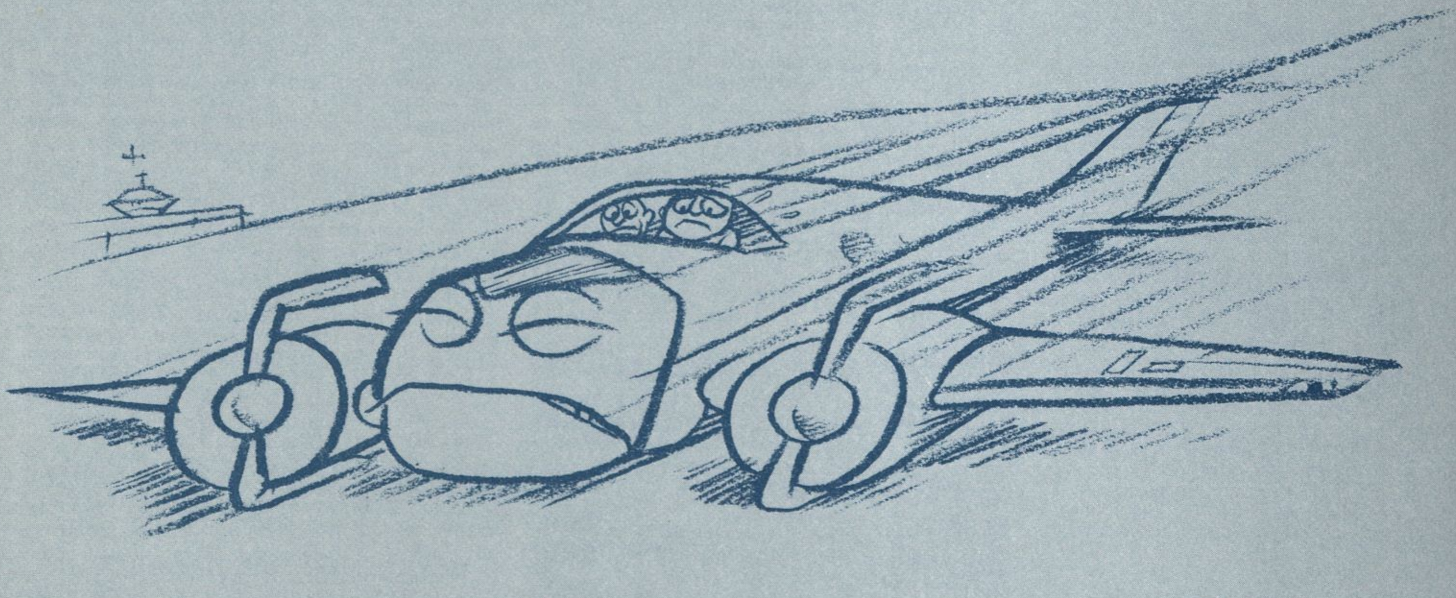

Lower the gear

Suggested by R. W. Brown, Jr.
FAA Aeronautical Center, Okla. City